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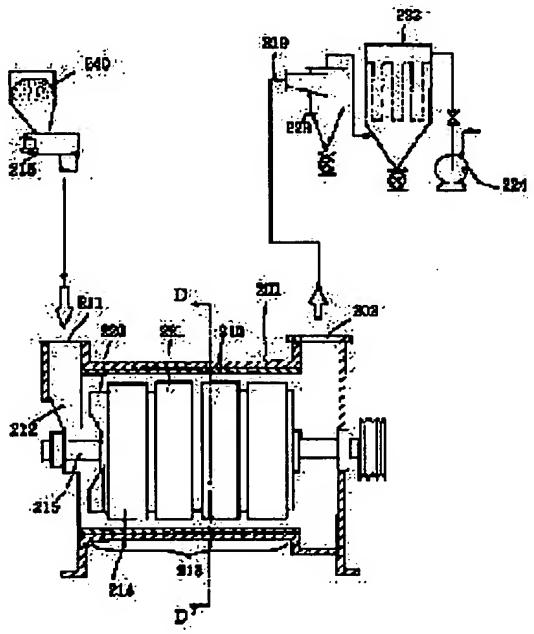
(54) MECHANICAL GRINDER AND TONER MANUFACTURING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a mechanical grinder capable of efficiently grinding a powder raw material, capable of obtaining sharp particle size distribution and suitably used in the production of toner.
SOLUTION: In the mechanical grinder having at least a powder charging port 21 for charging coarsely ground matter in a grinding means for finely grinding the coarsely ground matter, a stator 210, a rotor 214 attached to at least a center rotary shaft and a powder discharge port 202 for discharging the finely ground powder from the grinding means and constituted so that the stator includes the rotor and the rotor is arranged so as to have a predetermined gap between the surface of the stator and the surface of the rotor to form a grinding zone and the coarsely ground matter is ground in the grinding zone accompanied by the rotation of the rotor, the hardness of the grinding surface of the rotor is different from that of the grinding surface of the stator.



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CLAIMS

[Claim(s)]
[Claim 1] The fine-particles input port for supplying in a grinding means, in order to pulverize a coarse-grinding object, It has a stator, the rotator attached in the main revolving shaft at least, and a fine-particles exhaust port for discharging the pulverized fine particles from a grinding means at least. This stator has connoted this rotator, and a rotator is arranged and forms the grinding zone so that it may have a predetermined gap, and the front face of this stator and the front face of this rotator set it in a grinding zone. The mechanical-cable-type grinder characterized by the degree of hardness of the grinding side of this rotator differing from the degree of hardness of the grinding side of this stator in the mechanical-cable-type grinder constituted so that a coarse-grinding object may be ground with the revolution of this rotator.
[Claim 2] The mechanical-cable-type grinder according to claim 1 which antifriction processing of the grinding side of this rotator and the grinding side of this stator is carried out, respectively, and is characterized by the degree of hardness of the hardening layer of this rotator after antifriction processing differing from the degree of hardness of the hardening layer of this stator.
[Claim 3] The mechanical-cable-type grinder according to claim 2 characterized by for the degree of hardness of the hardening layer after antifriction processing of this rotator being in the Rockwell C degree of hardness HRC30 thru/or the range of 50, and the degree of hardness of the hardening layer after antifriction processing of this stator being in the Rockwell C degree of hardness HRC55 thru/or the range of 85.
[Claim 4] Carry out melting kneading of the mixture which contains binding resin and a coloring agent at least, and the obtained kneading object is cooled. In the manufacture approach of a toner of carrying out coarse grinding of the cooling object, pulverizing a coarse-grinding object with a grinding means, obtaining a pulverizing object, and manufacturing the weighted mean particle size 4 thru/or a 12-micrometer toner from the obtained pulverizing object The fine-particles input port for supplying in a grinding means, in order that this grinding means may pulverize a coarse-grinding object, It has a stator, the rotator attached in the main revolving shaft at least, and a fine-particles exhaust port for discharging the pulverized fine particles from a grinding means at least. This stator has connoted this rotator, and a rotator is arranged and forms the grinding zone so that it may have a predetermined gap, and the front face of this stator and the front face of this rotator set it in a grinding zone. The manufacture approach of the toner characterized by pulverizing with the mechanical-cable-type grinder with which it is the mechanical-cable-type grinder constituted so that a coarse-grinding object may be ground with the revolution of this rotator, and the degree of hardness of the grinding side of this rotator differs from the degree of hardness of the grinding side of this stator.
[Claim 5] The manufacture approach of the toner according to claim 4 which antifriction processing of the grinding side of this rotator and the grinding side of this stator is carried out, respectively, and is characterized by pulverizing with the mechanical-cable-type grinder with which the degree of hardness of the hardening layer of this rotator after antifriction processing differs from the degree of hardness of the hardening layer of this stator.
[Claim 6] The manufacture approach of the toner according to claim 5 characterized by pulverizing with the mechanical-cable-type grinder which has the degree of hardness of the hardening layer after antifriction processing of this rotator in the Rockwell C degree of hardness HRC30 thru/or the range of 50, and has the degree of hardness of the hardening layer after antifriction processing of this stator in the Rockwell C degree of hardness HRC55 thru/or the range of 85.
[Claim 7] It is characterized by antifriction processing of the grinding side of this rotator being processing in

which carry out build-up welding of the autogenous welding nature alloy which uses nickel and Cr as a principal component to a base material, and a wear-proof side is made to form. Antifriction processing of the grinding side of a stator The manufacture approach of the toner according to claim 5 or 6 characterized by being the processing in which heat and carry out melting of the sprayed coating again, and a wear-proof side is made to form after injecting at high speed towards a base material where the powder for thermal spraying is fused, and making a sprayed coating form.

[Claim 8] The manufacture approach of the toner according to claim 4 to 7 characterized by being the magnetic toner with which this toner contains the magnetic substance 60 thru/or the 200 mass sections to the binding resin 100 mass section.

[Claim 9] claim 4 which introduces a fine-particles raw material in a mechanical-cable-type grinder with cold blast thru/or 8 -- the manufacture approach of a toner given in either.

[Claim 10] The manufacture approach of a toner according to claim 9 that the temperature of cold blast is 0 thru/or -30.0 degrees C.

[Claim 11] A mechanical-cable-type grinder is the manufacture approach of a toner according to claim 4 to 10 of providing the cooling means for cooling inside the plane.

[Claim 12] A mechanical-cable-type grinder is the manufacture approach of the toner according to claim 4 to 11 which possesses the jacket for cooling inside the plane, and grinds a fine-particles raw material for cooling water with through in a jacket.

[Claim 13] A mechanical-cable-type grinder is the manufacture approach of a toner according to claim 4 to 12 that it is open for free passage to a fine-particles inlet, and has a vortex chamber, and the room temperature T1 of a vortex chamber is the temperature of 0 degree C or less.

[Claim 14] The manufacture approach of a toner according to claim 13 that the room temperatures T1 of the vortex chamber of a mechanical-cable-type grinder are temperature -5 thru/or -15 degrees C.

[Claim 15] The manufacture approach of a toner according to claim 13 that the room temperatures T1 of the vortex chamber of a mechanical-cable-type grinder are temperature -7 thru/or -12 degrees C.

[Claim 16] The pulverizing object generated within the mechanical-cable-type grinder is the manufacture approach of a toner according to claim 4 to 15 that it is discharged from a fine-particles exhaust port via an after [a mechanical-cable-type grinder] room outside the plane, and the room temperatures T2 of an after [this] room are temperature 30 thru/or 60 degrees C.

[Claim 17] The manufacture approach of a toner according to claim 4 to 16 that temperature-gradient deltaT (T2-T1) of a room temperature T2 and a room temperature T1 is 30 thru/or 80 degrees C.

[Claim 18] The manufacture approach of a toner according to claim 4 to 16 that temperature-gradient deltaT (T2-T1) of a room temperature T2 and a room temperature T1 is 35 thru/or 75 degrees C.

[Claim 19] The manufacture approach of a toner according to claim 4 to 16 that temperature-gradient deltaT (T2-T1) of a room temperature T2 and a room temperature T1 is 37 thru/or 72 degrees C.

[Claim 20] The glass transition points Tg of binding resin are 45 thru/or 75 degrees C, and the room temperature T1 of the vortex chamber of a mechanical-cable-type grinder is 0 degree C or less, and they are 60 thru/or the manufacture approach of a toner according to claim 4 to 19 which carries out temperature control so that 75 degrees C may become low from Tg.

[Claim 21] The glass transition points Tg of binding resin are 45 thru/or 75 degrees C, and the room temperature T2 of an after [a mechanical-cable-type grinder] room is 5 thru/or the manufacture approach of a toner according to claim 4 to 20 which carries out temperature control so that 30 degrees C may become low from Tg.

[Claim 22] The manufacture approach of a toner according to claim 4 to 21 that the head peripheral speed of a rotator is 80 thru/or 180 m/sec, and the least intervals between a rotator and a stator are 0.5 thru/or 10.0mm.

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DETAILED DESCRIPTION

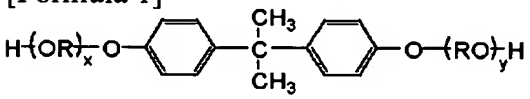
[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the approach of manufacturing a toner using the equipment which manufactures the toner formed from the binding resin used for the image formation by the xerography, and its equipment.
[0002]
[Description of the Prior Art] By the xerography, the electrostatic photographic method, and the image formation approach like an electrostatic printing method, the toner for developing an electrostatic-charge image is used.
[0003] Generally as the manufacture approach of the toner for electrostatic-charge image development The binding resin for making it fixed to imprinted material, the various coloring agents made to take out the tint as a toner, In the so-called 1 component developing-negatives method as used the electrification control agent for making a charge give a particle as a raw material or shown in JP,54-42141,A and JP,55-18656,A The various magnetic materials for giving conveyance nature etc. to the toner itself in addition to these are used. Furthermore, other additives, such as a release agent and a fluid grant agent, are added and blended dryly if needed. Melting kneading is carried out with general-purpose kneading equipments, such as a roll mill and an extruder, after an appropriate time. By making a kneading object detailed with various grinding equipments, such as a jet-stream type grinder and a machine collision type grinder, introducing the obtained coarse-grinding object into various pneumatic elutriation machines, and performing a classification, after carrying out cooling solidification The classification article arranged with a particle size required as a toner is obtained, and further, if needed, a plasticizer, lubricant, etc. are **(ed) outside, are blended dryly, and it is considering as the toner with which image formation is presented. Moreover, image formation is presented after mixing various magnetic carriers and the above-mentioned toner in the case of the toner used for the 2 component development approach.
[0004] As a grinding means, although various grinding equipments are used, the jet-stream type grinder using the **** jet stream shown in drawing 7 , especially the collision type air-current grinder are used for grinding of the toner crushing object which is mainly concerned with binding resin also in it.
[0005] The collision type air-current grinder using the high voltage gas like a jet stream conveyed the fine-particles raw material by the jet stream, injected it from the outlet of an acceleration tube, was made to collide with the collision side of the collision member which countered and prepared the fine-particles raw material in the effective area of the outlet of an acceleration tube, and has ground the fine-particles raw material according to the impulse force.
[0006] With for example, the high voltage gas which countered the outlet 163 of the acceleration tube 162 which connected the high voltage gas supply nozzle 161 in the collision type air-current grinder shown in drawing 7 , formed the collision member 164, and was supplied to the acceleration tube 162 Attract a fine-particles raw material in an acceleration tube 162 from the fine-particles feeding opening 165 which the halfway of an acceleration tube 162 was made to open for free passage, and spout a fine-particles raw material with a high voltage gas, it is made to collide with the collision side 166 of the collision member 164, the impact grinds, and the grinding object is made to discharge from the grinding object exhaust port 167.
[0007] However, the above-mentioned collision type air-current grinder spouts a fine-particles raw material with a high voltage gas, is made to collide with the collision side of a collision member, and for the

configuration that the impact grinds, in order to produce the toner of the diameter of a granule, it needs a lot of Ayr. Therefore, there is very much power consumption and it has the problem in the field of energy cost.
[0008] Energy saving of equipment is especially called for from the response to an environmental problem in recent years.
[0009] Then, instead of the conventional collision type air-current grinder, the need of a lot of Ayr is not carried out, but its attention is paid to the mechanical-cable-type grinder with little power consumption.
[0010] For example, it is constituted so that the annular space formed by having the rotator which is the body of revolution attached in the main revolving shaft at least, and the stator which holds this rotator front face and fixed spacing, and is arranged around the rotator in the mechanical-cable-type grinder shown in drawing 1 , and holding this spacing may be airtight.
[0011] Since there is little power consumption compared with the conventional collision type air-current grinder, such a mechanical-cable-type grinder can respond to energy saving of the equipment cried for in recent years. Moreover, since the configuration is roundish with the mechanical shock force, the toner ground by the mechanical-cable-type grinder can also cope with cleaner loess and the environmental problem of the amount cutback of waste toners.
[0012] However, the engine performance required of the toner as a toner also becomes severe much more with high-definition-izing and highly-minute-izing of a copying machine, a printer, etc., the particle diameter of a toner becomes small, a big and rough particle does not contain as particle size distribution of a toner, and the sharp thing which has a few superfines object is required increasingly in recent years. Moreover, also in the shape of the toner surface type, control of the shape of further toner surface type is called for with the demand of the environmental stability in high level.
[0013]
[Problem(s) to be Solved by the Invention] The object of this invention is to offer the manufacture approach of of the mechanical-cable-type grinder and toner with which the toner which solved the above-mentioned trouble is obtained.
[0014] That is, the above-mentioned trouble is solved, a fine-particles raw material can be ground efficiently, sharp particle size distribution are acquired, and the object of this invention is to offer the mechanical-cable-type grinder suitable for using for manufacture of a toner.
[0015] moreover, the thing for which the object of this invention Sharp-izes the particle size distribution of a toner by controlling the impact at the time of grinding appropriately in a mechanical-cable-type grinder, and fines generating is suppressed -- especially, there is no fogging in the non-image section to the bottom of a low-humidity/temperature environment, or generating of fogging is controlled, and a toner is to offer the manufacture approach of the toner obtained efficiently.
[0016]
[Means for Solving the Problem] The fine-particles input port for supplying in a grinding means, in order that this invention may pulverize a coarse-grinding object, It has a stator, the rotator attached in the main revolving shaft at least, and a fine-particles exhaust port for discharging the pulverized fine particles from a grinding means at least. This stator has connoted this rotator, and a rotator is arranged and forms the grinding zone so that it may have a predetermined gap, and the front face of this stator and the front face of this rotator set it in a grinding zone. In the mechanical-cable-type grinder constituted so that a coarse-grinding object may be ground with the revolution of this rotator, it is related with the mechanical-cable-type grinder characterized by the degree of hardness of the grinding side of this rotator differing from the degree of hardness of the grinding side of this stator.
[0017] Moreover, this invention carries out melting kneading of the mixture which contains binding resin and a coloring agent at least. In the manufacture approach of a toner of cooling the obtained kneading object, carrying out coarse grinding of the cooling object, pulverizing a coarse-grinding object with a grinding means, obtaining a pulverizing object, and manufacturing the weighted mean particle size 4 thru/or a 12-micrometer toner from the obtained pulverizing object The fine-particles input port for supplying in a grinding means, in order that this grinding means may pulverize a coarse-grinding object, It has a stator, the rotator attached in the main revolving shaft at least, and a fine-particles exhaust port for discharging the pulverized fine particles from a grinding means at least. This stator has connoted this rotator, and a rotator is arranged and forms the grinding zone so that it may have a predetermined gap, and the front face of this stator and the front face of this rotator set it in a

grinding zone. It is the mechanical-cable-type grinder constituted so that a coarse-grinding object may be ground with the revolution of this rotator, and is related with the manufacture approach of the toner characterized by pulverizing with the mechanical-cable-type grinder with which the degree of hardness of the grinding side of this rotator differs from the degree of hardness of the grinding side of this stator.
[0018] That the technical problem of the above-mentioned conventional technique should be solved, wholeheartedly, as a result of examination, this invention prevented too much grinding of a toner, carried out the knowledge of becoming possible to Sharp-ize the particle size distribution of a toner, and resulted in this invention by changing the degree of hardness of the hardening layer of the rotator in a mechanical-cable-type grinder, and a stator.
[0019] That is, by changing the degree of hardness of the hardening layer of the rotator by which many slots are established in the front face which carries out a high-speed revolution in the grinding processing interior of a room in the mechanical-cable-type grinder, and the stator by which many slots are established in the front face, too much grinding of a toner was prevented, the knowledge of becoming possible to Sharp-ize the particle size distribution of a toner was carried out, and it resulted in this invention.
[0020] Furthermore, since it was able to become possible to control the impact at the time of grinding appropriately by changing the degree of hardness of the above-mentioned rotator and a stator, the particle size distribution of a toner were able to be Sharp-ized and fines generating was suppressed, there is no fogging in the non-image section especially to the bottom of a low-humidity/temperature environment, or generating of fogging was controlled, and the toner carried out the knowledge of being obtained efficiently, and resulted in this invention.
[0021]
[Embodiment of the Invention] Hereafter, the gestalt of desirable operation is mentioned and this invention is further explained to a detail.
[0022] First, the raw material of the toner particle which is used by this invention and which contains binding resin and a coloring agent at least is explained.
[0023] [Wax] The various wax components conventionally known as a release agent can be used for the wax used for this invention, and there is the following in it. For example, as a hydrocarbon system wax, there is an aliphatic hydrocarbon system wax like low molecular weight polyethylene, low molecular weight polypropylene, a polyolefine copolymerization object, a polyolefine wax, a micro crystallin wax, paraffin wax, and the Fischer Tropsch wax etc.
[0024] The waxes which use the aliphatic-series ester like the mineral system wax; montanoic-acid ester wax like the vegetable system wax; beeswax like oxide [of the aliphatic hydrocarbon system wax like oxidization polyethylene wax]; or those block-copolymerization object; candelilla waxes, carnauba wax, haze wax, and a jojoba wax, lanolin, the animal system wax; ozokerite like a spermaceti, a ceresin, and a PETORO lactam, and a caster wax as a principal component as a wax which has a functional group: What was deoxidation-ized is mentioned [all / a part or] in the aliphatic series ester like deoxidation carnauba wax.
[0025] furthermore, a palmitic acid, stearin acid, a montanoic acid, or the long-chain alkyl carvone that has a further long-chain alkyl group -- the saturation straight-chain-fatty-acid; brassidic acid like acids -- Unsaturated fatty acid like an eleostearic acid and a BARINARIN acid; Stearyl alcohol, EIKO sill alcohol, behenyl alcohol, cow NABIRU alcohol, Ceryl alcohol, melissyl alcohol, or polyhydric alcohol like a saturated alcohol; sorbitol like the alkyl alcohol which has a further long-chain alkyl group; A linolic acid amide, Oleic amide, the aliphatic series amide like a lauric-acid amide; Methylenebis octadecanamide, An ethylene VISCA pudding acid amide, an ethylene bis-lauric-acid amide, the saturation aliphatic series bis-amide like hexa methylenebis octadecanamide; Ethylene bis-oleic amide, A hexa methylenebis oleic amide, N, and N'-dioleoyl adipic-acid amide, The unsaturated fatty acid amides like an N and N'-dioleoyl sebacic-acid amide; Meta xylene bis-octadecanamide, The aromatic series system bis-amide like an N and N'-distearyl isophthalic acid amide; Calcium stearate, Lauric-acid calcium, zinc stearate, aliphatic series metal salt (what is generally called metal soap); like magnesium stearate -- partial esterification object [of the fatty acid like a behenic acid monoglyceride, and polyhydric alcohol]; -- by hydrogenating vegetable fat and oil The methyl ester compound which has the hydroxyl obtained is mentioned.
[0026] There is a wax which made the aliphatic hydrocarbon system wax use and graft-ize the vinyl system monomer like styrene or an acrylic acid by the vinyl monomer as a wax by which the graft was carried out.

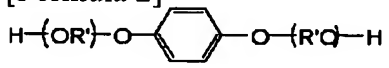
[0027] Under low voltage, Polyolefine which refined the low-molecular-weight by-product obtained as a wax used preferably at the time of the amount polyolefine polymerization of polyolefine; macromolecules which carried out the radical polymerization of the olefin under high voltage; A Ziegler catalyst, Polyolefine which carried out the polymerization using the catalyst like a metallocene catalyst; A radiation, Polyolefine which carried out the polymerization using an electromagnetic wave or light; Paraffin wax, A micro crystallin wax, the Fischer Tropsch wax; The gin toll method, the hydronalium calling method and AGE -- the synthetic wax; hydroxyl group which makes a monomer the compound of the synthetic hydrocarbon wax; carbon number piece compounded by law etc. -- hydrocarbon system wax; which has a carboxyl group or a functional group like an ester group -- mixture [of a hydrocarbon system wax and the hydrocarbon system wax which has a functional group]; -- these waxes -- a parent -- carrying out -- styrene -- The wax which carried out graft denaturation by the maleate, acrylate, methacrylate, and the vinyl monomer like a maleic anhydride is mentioned.
[0028] Moreover, what removed what made molecular weight distribution Sharp for these waxes using a press sweating process, a solvent method, the recrystallizing method, the vacuum distillation method, the supercritical gas extraction method, or the melt crystallization method, a low-molecular-weight solid fatty acid, low-molecular-weight solid alcohol, a low-molecular-weight solid compound, and other impurities is used preferably.
[0029] [Resin] As binding resin used for this invention, the various resin compounds conventionally known as binding resin can be used, for example, vinyl system resin, phenol resin, natural resin denaturation phenol resin, natural resin denaturation maleic resin, acrylic resin, methacrylic resin, Pori acetic-acid vinyl, silicone resin, polyester resin, polyurethane, polyamide resin, furan resin, an epoxy resin, xylene resin, a polyvinyl butyral, terpene resin, bear loin DIN resin, petroleum system resin, etc. are mentioned. Vinyl system resin and polyester system resin are desirable electrification nature and in respect of fixable especially.
[0030] As vinyl system resin, for example Styrene;o-methyl styrene, m-methyl styrene, p-methylene styrene, p-methoxy styrene, p-phenyl styrene, p-KURORU styrene, 3, 4-dichloro styrene, p-ethyl styrene, 2, 4-dimethyl styrene, p-n-butyl styrene, p-tert-butyl styrene, p-n-hexyl styrene, p-n-octyl styrene, p-n-nonyl styrene, The styrene derivative like p-n-DESHIRU styrene and p-n-dodecyl styrene; Ethylene, The partial saturation polyenes like an ethylene partial saturation monoolefins; butadiene like a propylene, a butylene, and an isobutylene; A vinyl chloride, The halogenation vinyl like a vinylidene chloride, vinyl bromide, and **-ized vinyl; Vinyl acetate, The vinyl ester like propionic-acid vinyl and BENZOE acid vinyl; A methyl methacrylate, Ethyl methacrylate, methacrylic-acid propyl, n-butyl methacrylate, Methacrylic-acid isobutyl, n-octyl methacrylate, methacrylic-acid dodecyl, 2-ethylhexyl methacrylate, stearyl methacrylate, methacrylic-acid phenyl, alpha-methylene aliphatic series monocarboxylic acid ester like dimethylaminoethyl methacrylate and diethylaminoethyl methacrylate; A methyl acrylate, An ethyl acrylate, acrylic-acid n-butyl, isobutyl acrylate, Acrylic-acid propyl, acrylic-acid n-octyl, acrylic-acid dodecyl, 2-ethylhexyl acrylate, acrylic-acid stearyl, acrylic-acid 2-KURORU ethyl, The acrylic ester like acrylic-acid phenyl; Vinyl methyl ether, The vinyl ether like vinyl ethyl ether and the vinyl isobutyl ether; A vinyl methyl ketone, The vinyl ketones;N-vinyl pyrrole like a vinyl hexyl ketone and a methyl isopropenyl ketone, N-vinylcarbazole, N-vinyl indole, and the N-vinyl compound; vinyl naphthalene like N-vinyl pyrrolidone : Acrylonitrile, The acrylic acid like a methacrylonitrile and acrylamide or methacrylic-acid derivative;alpha, the ester of beta-partial saturation acid, The diester of a dibasic acid; An acrylic acid, a methacrylic acid, alpha-ethyl acrylic acid, An acrylic acid and its alpha-, or beta-alkyl derivatives, such as a crotonic acid, a cinnamon acid, a vinyl acetic acid, isocrotonic acid, and angelic acid; A fumaric acid, The polymer using vinyl system monomers, such as partial saturation dicarboxylic acid, such as a maleic acid, a citraconic acid, an alkenyl succinic acid, an itaconic acid, mesaconic acid, a dimethyl maleic acid, and a dimethyl fumaric acid, and a monoester derivative of those, or an anhydride, is mentioned. By the above-mentioned vinyl system resin, a vinyl system monomer which was mentioned above is used by independent or two or more. Combination of a monomer which serves as a styrene system copolymer and a styrene-acrylic copolymer also in these is desirable.
[0031] Moreover, the binding resin used for this invention may be the polymer or copolymer over which the bridge was constructed by cross-linking monomer which is illustrated below if needed.
[0032] The monomer which has two or more unsaturated bonds which can construct a bridge as said cross-linking monomer can be used. As such a cross-linking monomer, various monomers as shown below are known conventionally, and can use suitable for the toner of this invention.

[0033] As a diacrylate compound which for example, divinyl ** NZEN and divinyl naphthalene were mentioned to said cross-linking monomer as an aromatic series divinyl compound, and was connected with; alkyl chain to it, for example Ethylene glycol diacrylate, 1, 3-butylene-glycol diacrylate, 1,4-butanediol diacrylate, 1,5-pentanediol diacrylate, As diacrylate compounds connected with the alkyl chain which that with which methacrylate replaced 1,6-hexanediol diacrylate, neopentyl glycol diacrylate, and the acrylate of the above compound is mentioned, and includes; ether linkage, for example Diethylene glycol diacrylate, triethylene glycol diacrylate, Tetraethylene glycol diacrylate, polyethylene-glycol #400 diacrylate, As diacrylate compounds connected with the chain which that with which methacrylate replaced polyethylene-glycol #600 diacrylate, dipropylene glycol diacrylate, and the acrylate of the above compound is mentioned, and includes; aromatic series radical and ether linkage, for example Polyoxyethylene (2) -2, 2-screw (4-hydroxyphenyl) propane diacrylate, that with which methacrylate replaced polyoxyethylene (4)-2 and 2-screw (4-hydroxyphenyl) pro van diacrylate and the acrylate of the above compound mentions -- having -- as; polyester mold diacrylate -- for example A trade name MANDA (Nippon Kayaku) etc. is mentioned.
[0034] That with which methacrylate replaced a pentaerythritol thoria chestnut rate, trimethylol triacrylate, trimethylolpropane triacrylate, tetramethylolmethane tetraacrylate, oligoester acrylate, and the acrylate of the above compound as a cross linking agent of many organic functions; a triaryl SHIANU rate, triallyl trimellitate, etc. are mentioned.
[0035] As binding resin used for this invention, the polyester resin shown below is also desirable. As for polyester resin, it is desirable that all 45-55-mol% in a component is an alcoholic component, and 55-45-mol% is an acid component.
[0036] alcohol -- a component -- ****** -- ethylene glycol -- propylene glycol -- 1,3-butanediol -- 1,4-butanediol -- two -- three - butanediol -- a diethylene glycol -- triethylene glycol -- 1,5-pentanediol -- one -- six - hexanediol -- neopentyl glycol -- two - ethyl - one -- three - hexandiol -- hydrogenation -- bisphenol A -- the following -- (-- B --) -- a formula -- expressing -- having -- a bisphenol -- a derivative --;
[0037]
[Formula 1]



(B)

(R shows ethylene or a propylene radical among a formula, and x and y are one or more integers, respectively, and the averages of x+y are 2-10.)
(C) Diols shown by the formula;
[0038]
[Formula 2]



(C)

(式中、R'は—CH_2CH_2— 、—CH_2—$CH(CH_3)$— 又は —CH_2—$C(CH_3)_2$— を示す。)

[0039] Or polyhydric alcohol, such as a glycerol, sorbitol, and sorbitan, is mentioned.
[0040] Moreover, as an acid component, a carboxylic acid can illustrate preferably. As a carboxylic acid of bivalence, a phthalic acid, a terephthalic acid, isophthalic acid, The ** NZEN dicarboxylic acid like phthalic anhydride, or the anhydride of those; A succinic acid, The alkyl dicarboxylic acid like an adipic acid, a sebacic acid, and an azelaic acid, or the anhydride of those; A fumaric acid, The partial saturation dicarboxylic acid like a maleic acid, a citraconic acid, and an itaconic acid or its anhydride is mentioned, and trimellitic acid, pyromellitic acid, ** NZOFE non tetracarboxylic acid, its anhydride, etc. are mentioned as a carboxylic acid more than trivalent.
[0041] It is the bisphenol derivative especially shown by the aforementioned (B) formula as an alcoholic component of desirable polyester resin, and the tricarboxylic acid of the dicarboxylic acid; trimellitic acid like a phthalic acid, a terephthalic acid, isophthalic acid or its anhydride, a succinic acid, an n-dodecenyl succinic acid or its anhydride, a fumaric acid, a maleic acid, and a maleic anhydride or its anhydride is mentioned as an acid

component. It is because fixable is good and it excels in offset-proof nature as a toner for heat roller fixation which used the polyester resin obtained from these acid components and an alcoholic component as binding resin.

[0042] The [magnetic substance] when using the toner of this invention as a magnetic toner, as a magnetic material contained in a magnetic toner Although it will not be limited especially if it is the magnetic substance currently used, for example Usually, magnetite, Maghemite, the iron oxide like a ferrite, and the iron oxide containing other metallic oxides; A metal like Fe, Co, and nickel, Or the alloys of these metals and a metal like aluminum, Co, Cu, Pb, Mg, nickel, Sn, Zn, Sb, Be, Bi, Cd, calcium, Mn, Se, Ti, W, and V, such mixture, etc. are mentioned.

[0043] As a magnetic material, specifically A tri-iron tetraoxide (Fe 3O4), an iron sesquioxide (gamma-Fe 2O3), An iron-oxide yttrium (Y3Fe 5O12), iron-oxide cadmium (CdFe 2O4), An iron-oxide gadolinium (Gd3Fe 5O12), iron-oxide copper (CuFe 2O4), Iron-oxide lead (PbFe 12O19), iron-oxide nickel (NiFe 2O4), Ferrous-oxide NIOJIMU (NdFe 2O3), ferrous-oxide barium (BaFe 12O19), ferrous-oxide magnesium (MgFe 2O4), a ferrous-oxide lanthanum (LaFeO3), iron powder (Fe), cobalt powder (Co), nickel powder (nickel), etc. are mentioned. It is independent, or two or more sorts of magnetic materials mentioned above are used, combining them. Especially a suitable magnetic material is the impalpable powder of a tri-iron tetraoxide or gamma-32 iron oxide.

[0044] Mean particle diameter is 0.05-2 micrometers, and these ferromagnetics have the desirable magnetic properties in 795.8 kA/m impression, when the thing of coercive force 1.6 - 12.0 kA/m, saturation magnetization 50-200Am2/kg (preferably 50-100 Am2/kg), and residual magnetization 2-20Am2/kg uses for the image formation approach of this invention, especially the electrophotography image formation approach.

[0045] Furthermore, it is desirable to the binding resin 100 mass section the 60 - 200 mass section and to carry out 80-150 mass section content of these magnetic substance still more preferably.

[0046] [Coloring agent] Although the magnetic substance may be used as a coloring agent in the toner of this invention as mentioned above, a nonmagnetic coloring agent etc. can be used as other coloring agents. As such a nonmagnetic coloring agent, the suitable pigment or suitable color of arbitration is mentioned. For example, as a pigment, there are carbon black, aniline black, acetylene black, naphthol yellow, Hansa yellow, a rhodamine lake, ** NGARA, a copper phthalocyanine blue, indanthrene blue, etc. these -- the binding resin 100 mass section -- receiving -- 0.1 - 20 mass section -- the addition of 1 - 10 mass section is preferably good. moreover, a color uses similarly -- having -- the binding resin 100 mass section -- receiving -- 0.1 - 20 mass section -- the addition of 0.3 - 10 mass section is preferably good.

[0047] That by which toning was carried out black is used using the yellow / Magenta / cyanogen coloring agent which shows the coloring agent used for this invention to carbon black, the magnetic substance, and the following as a black coloring agent.

[0048] As a yellow coloring agent, the compound represented by a condensation azo compound, an isoindolinone compound, the Anthraquinone compound, an azo metal complex, a methine compound, and the allyl compound amide compound is used. Specifically, the C.I. pigment yellow 12, 13, 14, 15, 17, 62, 74, 83, 93, 94, 95, 97, 109, 110, 111, 120, 127, 128, 129, 147, 168, 174, 176, 180, and 181 and 191 grades are used suitably.

[0049] As a Magenta coloring agent, a condensation azo compound, a diketo pyrrolo pyrrole compound, Anthraquinone, a KINAKU drine compounds compound, a base color lake compound, a naphthol compound, a bends imidazolone compound, a thioindigo compound, and a perylene compound are used. The C.I. pigment red 2, 3, 5, 6, 7, 23, 48:2, 48:3, 48:4, 57:1, 81:1, 144, 146, 166, 169, 177, 184, 185, 202, 206, 220, 221, and 254 is especially specifically desirable.

[0050] As a cyanogen coloring agent, a copper-phthalocyanine compound and its derivative, the Anthraquinone compound, a base color lake compound, etc. can be used. Specifically, the C.I. pigment blues 1, 7, 15, 15:1, 15:2, 15:3, 15:4, 60, 62, and 66 can use suitably especially.

[0051] [Electrification control agent] An electrification control agent can be used for the toner of this invention if needed in order to stabilize the electrification nature further. As for an electrification control agent, it is desirable per [0.1] binding resin 100 mass section - 10 mass sections, and to carry out a 1-5 mass section activity preferably, when controlling the electrification nature of a toner.

[0052] Although the various electrification control agents known conventionally can be used as an

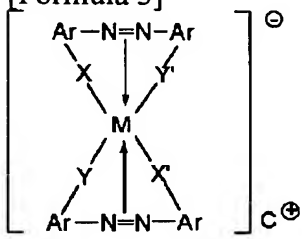
electrification control agent, the following are mentioned, for example.
[0053] As a negative electrification nature control agent which makes a toner negative electrification nature, an organometallic complex or a chelate compound is effective. A monoazo metal complex, the metal complex of aromatic series hydroxycarboxylic acid, and the metal complex of an aromatic series dicarboxylic acid system are mentioned. To others, aromatic series hydroxycarboxylic acid, aromatic series monochrome, polycarboxylic acid and its metal salt, its anhydride, its ester, or the phenol derivatives of a bisphenol are mentioned. As a desirable thing, it is monoazo metallic compounds and the metal policy compound of Cr, Co, and Fe of the phenol which has an alkyl group, a halogen, a nitro group, a carbamoyl group, etc. as a substituent, and the monoazo color compounded from a naphthol is mentioned. Moreover, the metallic compounds of aromatic carboxylic acid are also used preferably, and the metallic compounds of the carboxylic acid of the benzene and naphthalene which have an alkyl group, a halogen, a nitro group, etc., an anthracene, and a phenanthrene, hydroxycarboxylic acid, and dicarboxylic acid are mentioned.
[0054] As a forward electrification nature control agent which makes a toner forward electrification nature, Nigrosine, the Nigrosine derivative, a triphenylmethane color compound, organic quarternary ammonium salt, etc. are mentioned. For example, the denaturation object by Nigrosine, a fatty-acid metal salt, etc., tributyl benzyl ammonium-1-hydroxy-4-naphth sulfonate, Quarternary ammonium salt, such as tetrabutylammonium tetrafluoroborate, And onium salts and these lake pigments, triphenylmethane dye, and these lake pigments (as a lake-ized agent), such as phosphonium salt which is these analogs A **** tungstic acid, a **** molybdic acid, a **** tungsten molybdic acid, A tannic acid, a lauric acid, a gallic acid, a ferricyanide, ferrocyanide, etc., The metal salt of a higher fatty acid; Dibutyltin oxide, dioctyl tin oxide, JIORUGANO tin oxide [, such as dicyclohexyl tin oxide,]; -- JIORUGANO tin borate [, such as dibutyltin borate, dioctyl tin borate, and dicyclohexyl tin borate,]; -- these -- independent -- or two or more kinds can be combined and it can use.
[0055] [External additive] As mentioned above, as for the toner of this invention, it is common that the external additive for adjusting the fluidity of a toner, electrification nature, etc. other than a toner particle is included. As such an external additive, a flow improver may be added to the toner of this invention. A fluidity's comparison of addition order may increase a flow improver by **(ing) outside to a toner particle. For example, fluororesin powder like vinylidene fluoride impalpable powder; there is processing impalpable powder which performed surface treatment by the silane compound, the titanium coupling agent, and silicone oil about a wet process silica, the impalpable powder silica like a dry type process silica, impalpable powder titanium oxide, an impalpable powder alumina, and them.
[0056] It is given by processing chemically with pulverized coal, the organic silicon compound reacted or physisorbed as the hydrophobing approach.
[0057] As an organic silicon compound, hexamethyldisilazane, a trimethyl silane, Trimethylchlorosilane, trimethylethoxysilane, dimethyldichlorosilane, Methyltrichlorosilane, allyl compound dimethyl chlorosilicane, allyl compound phenyl dichlorosilane, ** NJIRU dimethyl chlorosilicane, BUROMOMETORI dimethyl chlorosilicane, alpha-chloro ethyl trichlorosilane, beta-chloro ethyl trichlorosilane, Chloro methyl dimethyl chlorosilicane, the Tori ORGANO silyl mercaptan, A trimethylsilyl mercaptan, Tori ORGANO silylacrylate, Vinyl dimethyl acetoxysilane, a dimethylethoxy silane, dimethyldimethoxysilane, diphenyl diethoxysilane -- passing -- KISAME chill disiloxane, 1, and 3-divinyl tetramethyl disiloxane -- The dimethylpolysiloxane containing the hydroxyl group combined with Si addressed to a piece, respectively etc. is in the unit which has 1 and 3-diphenyl tetramethyl disiloxane and 2-12 siloxane units per molecule, and is located in an end. Furthermore, the silicone oil like dimethyl silicone oil is mentioned. These are used with a kind or two sorts or more of mixture.
[0058] As a 0.1-5.0-micrometer particle used by this invention, a non-subtlety particle, organic particles, such mixture, and a composite are usable. Specifically, metallic oxides, such as strontium titanate, cerium oxide, an aluminum oxide, and a magnesium oxide, and fluororesin powder, a resin particle, etc. are mentioned. Strontium titanate and cerium oxide are desirable also especially in electrification property.
[0059] [Electrification control agent II] As for the toner of this invention, it is desirable to contain an electrification control agent.
[0060] The following compound is mentioned as what controls a toner to negative electrification nature.
[0061] An organometallic complex and a chelate compound are effective and the metal complex of a monoazo metal complex, an acetylacetone metal complex, an aromatic series hide ROKISHI carboxylic acid, and an

aromatic series die carboxylic acid is mentioned. To others, an aromatic series hide ROKISHI carboxylic acid, aromatic series monochrome, polycarboxylic acid and its metal salt, an anhydride, ester, and the phenol derivatives of a bisphenol are mentioned.

[0062] Especially, the azo system metal complex expressed with the following type (1) is desirable.

[0063]

[Formula 3]



(1)

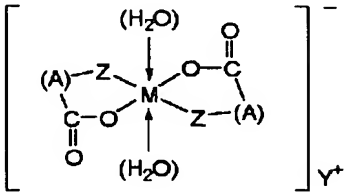
Among [type, M expresses a coordination core metal and Sc, Ti, V, Cr, Co, nickel, Mn, or Fe is mentioned. Ar is an aryl group, are a phenyl group and an aryl group like a naphthyl group, and may have a substituent. As a substituent in this case, there are a nitro group, a halogen radical, a carboxyl group, an anilide radical and an alkyl group of carbon numbers 1-18, and an alkoxy group of carbon numbers 1-18. X, X', Y, and Y' is -O-, -CO-, -NH-, and -NR- (R is the alkyl group of carbon numbers 1-4). C+ shows counter ion and shows hydrogen, sodium, a potassium, ammonium, aliphatic series ammonium, or those mixed ion.]

[0064] Especially as a central metal, Fe or Cr is desirable, a halogen, an alkyl group, or an anilide radical is desirable as a substituent, and hydrogen, alkali metal, ammonium, or aliphatic series ammonium is desirable as counter ion. The mixture of the complex salt with which counter ion differs is also used preferably.

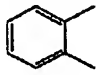
[0065] It is desirable as an electrification control agent which the basic organometallic complex shown in the following type (2) also gives negative electrification nature.

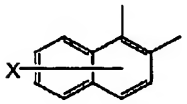
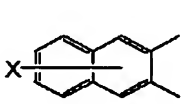
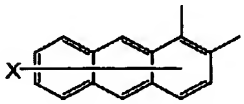
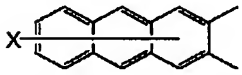
[0066]

[Formula 4]

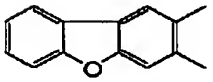
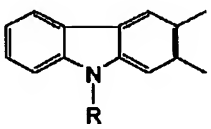
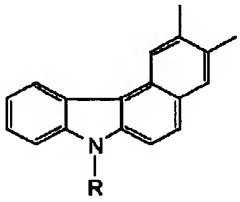


(2)

〔式中、Mは配位中心金属を表し、Ｃｒ、Ｃｏ、Ｎｉ、Ｆｅ、Ｚｎ、Ａｌ、Ｓｉ又はＢなどが挙げられる。Aは  （アルキル基などの置換基を有していてもよい）、


、

、

、


（Xは、水素原子、ハロゲン原子、ニトロ基又はアルキル基を示す）および

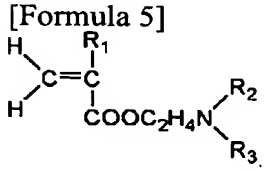

、

、


（Rは、水素原子、C_1 ～C_{18}のアルキル又はC_2 ～C_{18}のアルケニル基を示す）を表す。

Y^+はカウンターイオンを示し、水素、ナトリウム、カリウム、アンモニウム又は脂肪族アンモニウム或いはそれらの混合イオンを示す。Ｚは－Ｏ－或いは

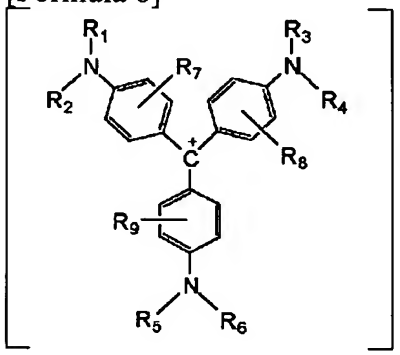
である。〕

[0067] There is the following compound to control a toner to forward electrification nature.
[0068] The Nigrosine conversion object by Nigrosine, a fatty-acid metal salt, etc.; Tributyl benzyl ammonium-1-hydroxy-4-naphth sulfonate, Quarternary ammonium salt, such as tetrabutylammonium tetrafluoroborate, And the onium salts like the phosphonium salt which is these analogs and these lake pigments; triphenylmethane dye and these lake pigments (as a lake-ized agent) A **** tungstic acid, a **** molybdic acid, a **** tungsten molybdic acid, The metal salt of; higher fatty acids, such as a tannic acid, a lauric acid, a gallic acid, a ferricyanide, and ferrocyanide; Dibutyltin oxide, Dioctyl tin oxide, JIORUGANO tin oxide like dicyclohexyl tin oxide; Dibutyltin borate, The JIORUGANO tin borate; guanidine compound like dioctyl tin borate and dicyclohexyl tin borate; an imidazole compound is mentioned. It is independent, or two or more kinds of these can be combined, and can be used.
[0069] Also in these, the quarternary ammonium salt a triphenylmethane color compound and whose counter ion are not halogens is used preferably. The following type (3)
[0070]
[Formula 5]



(3)

As for the inside R1 of [type, H or CH3 are shown and R2 and R3 show the alkyl group (preferably C1-C4) which is not permuted [a permutation or].] The single polymer of the monomer come out of and expressed; a copolymer with the polymerization nature monomer like the styrene mentioned above, acrylic ester, and methacrylic ester can be used as a forward electrification nature control agent. In this case, this single polymer and copolymer have a function as an electrification control agent, and a function as binding resin (all or part).
[0071] The compound expressed especially with the following formula (4) is desirable as a toner forward electrification nature control agent of this invention.
[0072]
[Formula 6]



(4)

Among [type, even if R1, R2, R3, R4, R5, and R6 are mutually the same respectively, they may differ from each other, and they express the aryl group which is not permuted [the alkyl group which is not permuted / a hydrogen atom, a permutation, or /, a permutation or]. Even if R7, R8, and R9 are mutually the same respectively, they may differ from each other, and they express a hydrogen atom, a halogen atom, an alkyl group, and an alkoxy group. A- shows sulfate ion, nitrate ion, way acid ion, phosphoric acid ion, a hydroxide ion, organic sulfate ion, organic sulfonic-acid ion, organic phosphoric acid ion, carboxylic-acid ion, organic way acid ion, and the anion like tetrafluoroborate.]
[0073] As an approach of making a toner containing a charge control agent, there are an approach of adding inside a toner particle and a method of **(ing) outside. although it is not what is determined as amount of these charge control agents used by the toner manufacture approach including the class of binding resin, the existence of other additives, and the distributed approach, and is limited uniquely -- desirable -- the binding resin 100 mass section -- receiving -- 0.1 - 10 mass section -- it is more preferably used in the range of 0.1 - 5 mass section.
[0074] Next, the procedure of manufacturing a toner by the manufacture approach of the toner of this invention is explained using a formation ingredient, an external additive, etc. of a toner particle which were mentioned above. First, at a raw material mixing process, as a toner internal agent, at least, specified quantity weighing capacity of resin and the coloring agent is carried out, they are blended, and it mixes. As an example of mixed equipment, there are a double contest mixer, a V type mixer, a drum-type mixer, a super mixer, a Henschel mixer, a NAUTA mixer, etc.
[0075] Furthermore, melting kneading of the toner raw material which blended above and was mixed is carried out, resin is fused, and a coloring agent etc. is distributed in it. At the melting kneading process, batch type kneading machines, such as a pressurized kneader and a Banbury mixer, and the kneading machine of continuous system can be used, for example. In recent years, one shaft or a biaxial extruder has become in use from the predominance of being able to produce continuously, for example, generally a KTK mold [by Kobe Steel, Ltd.] biaxial extruder, a TEM mold [by Toshiba Machine Co., Ltd.] biaxial extruder, the Casey Kay biaxial extruder, a PCM mold [by Ikegai Corp.] biaxial extruder, the Bus KO kneader, etc. are used. Furthermore, the coloring resin constituent obtained by carrying out melting kneading of the toner raw material is cooled through the cooling process which rolls out with 2 rolls etc. after melting kneading, and is cooled with water cooling etc.
[0076] Subsequently even to a desired particle size, the cooling object of the coloring resin constituent obtained above is ground at a grinding process. At a grinding process, first, coarse grinding is carried out with a crusher, a hammer mill, a feather mill, etc., and it pulverizes with a mechanical-cable-type grinder further. At a grinding

process, it is gradually ground to a predetermined toner grain size in this way. Furthermore, after grinding, using classifiers, such as elbow jet of an inertial classification method, MIKUROPU REXX of a centrifugal-force classification method, and DS separator, a toner is classified and a toner with a weighted mean particle diameter of 4-12 micrometers is obtained. In this, especially a hyperfractionation air-current type classifier is desirable as a classifier.

[0077] As an example of a desirable hyperfractionation air-current type classifier, the equipment of the format shown in drawing 4 (sectional view) is illustrated as one example, and is explained.

[0078] In drawing 4 , a side attachment wall 22 and G block 23 form a part of classification room, and the classification edge blocks 24 and 25 possess the classification edges 17 and 18. G blocks of things made to slide an installation location to right and left are possible for 23. Moreover, centering on Shafts 17a and 18a, the classification edges 17 and 18 are rotatable, can rotate a classification edge and can change a classification edge head location. As for each classification edge blocks 24 and 25, it is possible to make an installation location slide to right and left, and each knife-edge type of classification edges 17 and 18 also slide them to right and left in connection with it. With these classification edges 17 and 18, the classification region 30 of the classification room 32 is demarcated for 3 minutes.

[0079] The feeding nozzle 16 which has the feeding opening 40 for introducing raw material fine particles at the last edge of the feeding nozzle 16, and has the high voltage Ayr supply nozzle 41 and the raw material fine-particles installation nozzle 42 in the back end section of this feeding nozzle 16, and has opening in the classification room 32 is formed in the right-hand side of a side attachment wall 22, and the KOAN dub lock 26 is installed so that a prolate ellipsoid arc may be drawn to the extended direction of the lower tangent of this feeding nozzle 16. The left part block 27 of the classification room 32 possesses the intake air edge 19 of a knife-edge mold in the right side direction of the classification room 32, and has formed further the intake air tubing 14 and 15 which carries out opening to the classification room 32 in the left-hand side of the classification room 32. Moreover, as shown in drawing 2 , the 1st gas installation accommodation means 20 and the 2nd gas installation accommodation means 21 like a damper, static pressure 28 [a total of], and static pressure 29 [a total of] are provided in the intake air tubing 14 and 15.

[0080] It is adjusted by the classification edge 17, the class of toner 18 or G blocks of whose locations of 23 and the intake air edge 19 are a classified processing raw material, and desired particle size.

[0081] Moreover, the top face of the classification room 32 is made to correspond to each fractionation region, it has the exhaust ports 11, 12, and 13 which carry out opening to the classification interior of a room, the free passage means like a pipe is connected to exhaust ports 11, 12, and 13, and the closing motion means like a bulb means may be formed in each.

[0082] the feeding nozzle 16 -- from a right-angle cylinder part and a **** cylinder part -- becoming -- the ratio of the bore of a right-angle cylinder part, and the bore of the narrowest part of a **** cylinder part -- 20:1 to 1:1 -- if it is preferably set as 2:1 from 10:1, a good introductory rate will be obtained.

[0083] Classification actuation in the hyperfractionation classification region which it comes to constitute as mentioned above is performed as follows, for example. That is, the classification interior of a room is decompressed through at least one of the exhaust ports 11, 12, and 13, preferably, at the rate of the 10-350m/second of the rates of flow, fine particles are spouted in a classification room through the feeding nozzle 16, and the ejector effectiveness of compression Ayr injected from the air current and the high voltage Ayr supply nozzle 41 which flow the inside of the feeding nozzle 16 which has opening in the classification interior of a room with this reduced pressure distributes.

[0084] An operation according [the particle in the fine particles introduced into the classification room] to the Coanda effect of the KOAN dub lock 26, Draw a bow line according to an operation of the gas like the air which flows in that case, and it moves. It responds to the particle size of each particle, and the size of an inertia force. A large particle (coarse grain) The outside of an air current, The 1st fractionation of the outside of the classification edge 18, and a middle particle Namely, the 2nd fractionation between the classification edges 18 and 17, A small particle is classified in the 3rd fractionation inside the classification edge 17, the classified large particle is discharged from an exhaust port 11, the classified middle particle is discharged from an exhaust port 12, and the classified small particle is discharged from an exhaust port 13, respectively.

[0085] In the classification of the above-mentioned fine particles, a cut size is mainly determined by the edge head location of the classification edges 17 and 18 to the soffit part of the KOAN dub lock 26 which is the

location of which fine particles jump out into the classification room 32. Furthermore, a cut size is influenced of the spray velocity of the fine particles from the attraction flow rate or the feeding nozzle 16 of a classification air current etc.

[0086] Especially the hyperfractionation air-current type classifier explained above is effective when it classifies the coloring resin fine particles for a toner or toners used for the image formation method by the xerography.

[0087] Furthermore, in the hyperfractionation air-current type classifier of the format shown in drawing 4 , since the classification edge block which possess a feeding nozzle, a raw material fine-particles installation nozzle, and a high voltage Ayr supply nozzle in the top-face section of a hyperfractionation air-current type classifier, and possess this classification edge enabled it to change the location as it be able to changed the configuration of a classification region, the sharpness of classification can be raised by leaps and bounds rather than the conventional air-current type classifier.

[0088] In addition, the toner coarse powder which was classified at the classification process and generated is again returned and ground at a grinding process. Moreover, the fines generated at the classification process may be returned and reused to the compounding operation of a toner raw material.

[0089] Furthermore, in the toner manufacture approach of this invention, to the toner particle obtained as mentioned above, at least, mean particle diameter uses a non-subtlety particle 50nm or less as an external additive, and ** it outside. It is desirable churning and to mix, using the high-speed agitator which carries out specified quantity combination of the classified toner and the various well-known external additives as an approach of ******(ing) an external additive outside to a toner, and gives shearing force to fine particles, such as a Henschel mixer and a super mixer, as an outside ** machine. Under the present circumstances, it is more desirable to carry out a temperature control with the means of cooling the perimeter of the container section of an outside ** machine with water, since generation of heat is produced inside an outside ** machine and it becomes easy to generate an aggregate.

[0090] The manufacture approach of a toner of having used the mechanical-cable-type grinder and this mechanical-cable-type grinder which are used at the grinding process of the toner particle of this invention is explained concretely, referring to a drawing.

[0091] Drawing 1 shows an example of the grinding process defined system of the toner particle incorporating the mechanical-cable-type grinder used for this invention, drawing 2 shows this abbreviation-sectional view in the D-D' side in drawing 1 , and drawing 3 shows the perspective view of the rotator which carries out a high-speed revolution in drawing 1 .

[0092] In the mechanical-cable-type grinder shown in drawing 1 It is in casing 313 and casing 313. Cooling water Fixed spacing is held on the periphery of a rotator 314 and a rotator 314 by which many slots are established in the front face which consists of a jacket 316 which can let water flow, and body of revolution which is in casing 313 and was attached in the main revolving shaft 312, and which carries out a high-speed revolution. It consists of raw material exhaust ports 302 for discharging the stator 310 by which many slots are established in the front face arranged, the raw material input port 311 for introducing a processed raw material further, and the fine particles after processing. The spacing part of a rotator 314 and a stator 310 is a grinding zone.

[0093] In the mechanical-cable-type grinder which it comes to constitute as mentioned above When the fine-particles raw material of the specified quantity is thrown into the raw material input port 311 of a mechanical-cable-type grinder from the constant feeding machine 315 shown in drawing 1 , a particle The rotator 314 by which many slots are established in the front face which is introduced into the grinding processing interior of a room, and carries out a high-speed revolution in this grinding processing interior of a room, It is momentarily ground by the impact generated between the stators 310 by which many slots are established in the front face, and the pressure oscillation of the RF generated by this in the ultra high-speed vortex of a large number produced back [this], and a list. Then, the raw material exhaust port 302 is passage and discharged. Ayr (air) which is conveying the toner particle is discharged out of the system of a process defined system via a grinding processing room through the raw material exhaust port 302, a pipe 219, the collection cyclone 229, a bag filter 222, and the attraction filter 224. In this invention, since grinding of a fine-particles raw material is performed, desired grinding processing can be performed easily, without increasing fines and coarse powder.

[0094] As such mechanical-cable-type grinding, grinder INOMAIZA by Hosokawa Micron CORP., the grinder

KURIPU TRON by Kawasaki Heavy Industries, Ltd., P-mold of the turbo mill made from Turbo Industry, M-mold, B-mold, E-mold, R-mold, EX-mold, RS-mold, etc. can be mentioned, for example.
[0095] Antifriction processing of the base material of the grinding side of a rotator and a stator is carried out, and the description of the mechanical-cable-type grinder of this invention is that the degree of hardness of the hardening layer of this rotator after antifriction processing differs from the degree of hardness of the hardening layer of this stator, respectively.
[0096] Furthermore, antifriction processing of the base material of the grinding side of a rotator and a stator is carried out, and the description of the manufacture approach of the toner of this invention is that the degree of hardness of the hardening layer of this rotator after antifriction processing and the degree of hardness of the hardening layer of this stator grind a toner using the mechanical-cable-type grinder controlled to differ, respectively.
[0097] That is, as a result of this invention person's examination, by carrying out antifriction processing of the base material of the grinding side of a rotator and a stator, and grinding a toner using the mechanical-cable-type grinder with which the degree of hardness of the hardening layer of the rotator after antifriction processing differs from the degree of hardness of the hardening layer of a stator, the impact at the time of grinding can be controlled in the suitable condition, too much grinding can be prevented, and Sharp and fines generating can lessen [the particle size distribution of a toner]. Moreover, the toner with which there is no fogging in the non-image section especially to the bottom of a low-humidity/temperature environment, or generating of fogging is controlled can be obtained efficiently.
[0098] Furthermore, in the mechanical-cable-type grinder of this invention, and the manufacture approach of a toner, the degree of hardness of the hardening layer after antifriction processing of a rotator is the range of the Rockwell C degrees of hardness 30-HRC 50, and it is desirable that the degree of hardness of the hardening layer after antifriction processing of a stator uses the thing of the range of the Rockwell C degrees of hardness 55-HRC 85.
[0099] That is, as a result of this invention person's examination, when the degree of hardness of a rotator uses the thing of a combination lower than the degree of hardness of a stator, the impact at the time of grinding can be controlled in the suitable condition, too much grinding can be prevented, and Sharp and fines generating can lessen [the particle size distribution of a toner].
[0100] The above-mentioned Rockwell C degree of hardness is the number which reduced the depth (1/500mm is expressed as a unit.) of the depression when adding a 98 Ns (10kg) load, pressing the trial side of a sample first using a diamond cone with 120 vertical angles and a head radius of 0.2mm, then considering as a 1470 Ns (150kg) load, and returning to a 98 Ns (10kg) load again from 100.
[0101] Furthermore, in the mechanical-cable-type grinder of this invention, and the manufacture approach of a toner, the degree of hardness of the hardening layer of the grinding side of a rotator and a stator is controllable in the above-mentioned range by performing antifriction processing to the grinding side of the rotator of this mechanical-cable-type grinder, and a stator.
[0102] Although a well-known approach is used as said antifriction processing It is related with antifriction processing of the grinding side of a rotator as a result of this invention person's examination. The processing in which carry out build-up welding of the autogenous welding nature alloy which uses nickel and Cr as a principal component to a base material, and abrasion resistance is made to form is desirable, and is related with antifriction processing of the grinding side of a stator. The processing in which heat and carry out melting of the sprayed coating again, and an antifriction side is made to form after injecting at high speed towards a base material where the powder for thermal spraying is fused, and making a sprayed coating form Or the hard-coal-ized chrome plating processing which coated the base material with the chromium carbide alloy with high intermolecular degree of coupling using the mixed catalyst is desirable.
[0103] That is, by performing the above-mentioned antifriction processing to a rotator and a stator, respectively, the impact at the time of grinding can be controlled in the suitable condition, too much grinding can be prevented, the toner which carries out sharp ********** with few amounts of fines is obtained, and the toner with which there is no fogging in the non-image section to the bottom of a low-humidity/temperature environment further, or generating of fogging is controlled can be obtained.
[0104] In addition, the configuration of a stator and a rotator does not need to be limited at all.
[0105] Next, in case the mechanical-cable-type grinder which performed wear-proof processing in which the

grinding side of a rotator and/or a stator was described above, and controlled the degree of hardness of the hardening layer of a rotator and a stator on the above-mentioned conditions grinds feed to pulverizing machine, it is desirable to ventilate cold blast in a mechanical-cable-type grinder with a fine-particles raw material with the cold blast generating means 321. Furthermore, as for the temperature of the cold blast, it is desirable that they are 0 thru/or -30 degrees C. Furthermore, it is desirable to make a mechanical-cable-type grinder into the structure of having the jacket structure 316, as a cooling means of the body of a mechanical-cable-type grinder inside the plane, and to let cooling water (preferably antifreezing solutions, such as ethylene glycol) flow. furthermore, the room temperature T1 in the vortex chamber 212 which is open for free passage to the fine-particles inlet in a mechanical-cable-type grinder with above-mentioned cold blast equipment and jacket structure -- 0 degree C or less -- more -- desirable -5- it is desirable from the point of toner productivity to consider as -7--12 degree C still more preferably -15 degrees C. the room temperature T1 of the vortex chamber in a grinder -- 0 degree C or less -- more -- desirable -5- by considering as -7--12 degree C still more preferably, surface deterioration of the toner by heat can be suppressed and -15 degrees C of feed to pulverizing machine can be ground efficiently. It is not desirable at that of a lifting or a cone from the point of toner productivity for the surface deterioration of a toner or the welding inside the plane by heat at the time of grinding an exceeding [the room temperature T1 of the vortex chamber in a grinder]-0 degree C case.

[0106] Moreover, as a refrigerant used with the above-mentioned cold blast generating means 321, the point of the environmental problem of the whole earth to a chlorofluorocarbon-replacing material is desirable.

[0107] As a chlorofluorocarbon-replacing material, although R134a, R404A, R407c, R410A, R507A, and R717 grade is mentioned, especially R404A is desirable from the point of energy-saving nature or safety in this.

[0108] In addition, cooling water (preferably antifreezing solutions, such as ethylene glycol) is supplied to the interior of a jacket from the cooling water feed hopper 317, and is discharged from the cooling water exhaust port 318.

[0109] Moreover, the pulverizing object generated within the mechanical-cable-type grinder is discharged from the fine-particles exhaust port 302 via the after [a mechanical-cable-type grinder] room 320 outside the plane. It is desirable in that case that the room temperatures T2 of the after [a mechanical-cable-type grinder] room 320 are 30 thru/or 60 degrees C from the point of toner productivity. By making the room temperature T2 of the after [a mechanical-cable-type grinder] room 320 into 30 thru/or 60 degrees C, surface deterioration of the toner by heat can be suppressed and feed to pulverizing machine can be ground efficiently. When the temperature T2 of a mechanical-cable-type grinder is smaller than 30 degrees C, the short pass may be caused without being ground and it is not desirable from the point of the toner engine performance. Moreover, when larger than 60 degrees C, overgrinding may be carried out at the time of grinding, and it is not desirable at that of a lifting or a cone from the point of toner productivity for the surface deterioration of a toner or the welding inside the plane by heat.

[0110] Moreover, in case a mechanical-cable-type grinder grinds feed to pulverizing machine, it is desirable to make temperature-gradient deltaT (T2-T1) of the room temperature T1 of the vortex chamber 212 of a mechanical-cable-type grinder and the room temperature T2 of the after room 320 into 30-80 degrees C, and it is more preferably desirable from the point of toner productivity to consider as 37-72 degrees C still more preferably 35-75 degrees C. By making more preferably 30-80 degrees C of 35-75 degrees C of the temperature T1 and temperature T2 and delta T of a mechanical-cable-type grinder into 37-72 degrees C still more preferably, surface deterioration of the toner by heat can be suppressed and feed to pulverizing machine can be ground efficiently. When smaller than 40 degrees C, the temperature T1 and temperature T2 and delta T of a mechanical-cable-type grinder may have caused the short pass, without being ground, and are not desirable from the point of the toner engine performance. Moreover, when larger than 70 degrees C, overgrinding may be carried out at the time of grinding, and it is not desirable at that of a lifting or a cone from the point of toner productivity for the surface deterioration of a toner or the welding inside the plane by heat.

[0111] moreover, the time of a mechanical-cable-type grinder grinding feed to pulverizing machine -- glass point transfer (Tg) of binding resin -- 45 -- or 55 thru/or 65 degrees C are still more desirable 75 degrees C. Moreover, the room temperature T1 of the vortex chamber 212 of a mechanical-cable-type grinder is 0 degree C or less to Tg, and it is more desirable than Tg from the point of toner productivity 60 thru/or to make 75 degrees C low. It is 0 degree C or less about the room temperature T1 of the vortex chamber 212 of a mechanical-cable-type grinder, and rather than Tg, 60 thru/or by making 75 degrees C low, surface deterioration of the toner by

heat can be suppressed and feed to pulverizing machine can be ground efficiently. moreover, the room temperature T2 of the after [a mechanical-cable-type grinder] room 320 -- Tg -- 5 -- or 10 thru/or a thing low 20 degrees C are still more desirable 30 degrees C. Surface deterioration of 5 thru/or the toner according to heat 10 thru/or by making 20 degrees C low more preferably 30 degrees C can be suppressed for the room temperature T2 of the after [a mechanical-cable-type grinder] room 320 rather than Tg, and feed to pulverizing machine can be ground efficiently.

[0112] In addition, in this invention, the glass transition point Tg of binding resin was measured on condition that the following using a differential thermal analyzer (DSC measuring device) and DSC-7 (PerkinElmer, Inc. make).

Sample: It is the 10mg temperature curve:temperature up I (20 degrees C -> 180 degrees C, programming-rate 10degree C/min.) preferably 5-20mg.

Temperature fall I (180 degrees C -> 10 degrees C, temperature fall rate 10degree C/min.)

Temperature up II (10 degrees C -> degrees C [180], programming-rate 10degree C/min.)

Let Tg measured by temperature up II be measured value.

Measuring method: Pay a sample into an aluminum pan and use an empty aluminum pan as a reference. The intersection of the line of the midpoint of the base line after coming out before an endoergic peak comes out, and a differential heat curve was made into the glass transition point Tg.

[0113] Moreover, it is desirable that it is 80 - 180 m/sec as a head peripheral speed of the rotator 314 to rotate, and it is more preferably desirable from the point of toner productivity to consider as 100 - 160 m/sec still more preferably 90 to 170 m/sec. By making peripheral speed of the rotator 314 to rotate into 100 - 160 m/sec still more preferably 90 to 170 m/sec more preferably 80 to 180 m/sec, the lack of grinding of a toner and overgrinding can be stopped and feed to pulverizing machine can be ground efficiently. When the peripheral speed of a rotator is slower than 80 m/sec, it is not desirable at that of a lifting or a cone from the point of [without being ground] the toner engine performance for a short pass. Moreover, when the peripheral speed of a rotator 314 is quicker than 180 m/sec, overgrinding is carried out to that the load of equipment itself becomes large, and coincidence at the time of grinding, and it is not desirable at that of a lifting or a cone from the point of toner productivity for the surface deterioration of a toner or the welding inside the plane by heat.

[0114] Moreover, as for the minimum interval between a rotator 314 and a stator 310, it is desirable that it is 0.5-10.0mm, and it is more preferably desirable to be referred to as 1.0-3.0mm still more preferably 1.0-5.0mm. By setting spacing between a rotator 314 and a stator 310 to 1.0-3.0mm still more preferably 1.0-5.0mm more preferably 0.5-10.0mm, the lack of grinding of a toner and overgrinding can be stopped and feed to pulverizing machine can be ground efficiently. When spacing between a rotator 314 and a stator 310 is larger than 10.0mm, it is not desirable at that of a lifting or a cone from the point of [without being ground] the toner engine performance for a short pass. Moreover, when spacing between a rotator 314 and a stator 310 is smaller than 0.5mm, overgrinding is carried out to that the load of equipment itself becomes large, and coincidence at the time of grinding, and it is not desirable at that of a lifting or a cone from the point of toner productivity for the surface deterioration of a toner or the welding inside the plane by heat.

[0115]

[Example] Next, the example and the example of reference of this invention are given, and this invention is further explained to a detail.

[0116]

[Example 1]

- Binding resin (polyester resin) : The 100 mass sections (Tg59 degree C, acid-number 20 mgKOH/g, hydroxyl-value 30 mgKOH/g, the amount of molecule s: Mp6800, Mn2900, Mw53000)
- Magnetic oxide of iron: 90 mass sections (property Hc9.1kA /m in the mean particle diameter of 0.20 micrometers, and a 795.8 kA/m magnetic field, sigmas82.1Am2/kg, sigmar11.4Am2/kg)
- Monoazo metal complex (negative electrification control agent) : Two mass sections and low-molecular-weight ethylene propylene rubber: The ingredient of a formula of 3 mass sections above was kneaded with the biaxial kneading machine (PCM-30 mold, Ikegai Corp. make) set as the temperature of 150 degrees C, after a Henschel mixer (FM-75 mold, product made from Mitsui Miike Chemically-modified Opportunity) may be used and mixing. The obtained kneading object was cooled, coarse grinding was carried out to 1mm or less with the hammer mill, and the fine-particles raw material (coarse-grinding object) which is a fine-particles raw

material for toner manufacture was obtained.
[0117] It classified with the hyperfractionation air-current type classifier 1 which pulverizes with the mechanical-cable-type grinder 301 (modification machine which converted the turbo mill [by the turbo industrial company] T250-RS mold as follows) which shows the obtained fine-particles raw material to drawing 1 , and shows the obtained pulverizing article to drawing 4 .
[0118] In this example, wear-proof processing of the base material of the grinding side of the rotator 314 of the mechanical-cable-type grinder 301 and a stator 310 is carried out. In the grinding side of a rotator Processing in which carry out build-up welding of the autogenous welding nature alloy which uses nickel and Cr as a principal component to a base material, and a wear-proof side is made to form is performed. In the grinding side of a stator After having injected at high speed towards the base material where the powder for thermal spraying is fused, and making a sprayed coating form, processing in which heat and carry out melting of the sprayed coating again, and a wear-proof side is made to form was performed. Moreover, 40 and the Rockwell C degree of hardness of a stator of the Rockwell C degree of hardness of a rotator at this time were 65. Moreover, 1.5mm and the grinding amount of supply were ground [the peripheral speed of a rotator 314] for the gap of 115 m/s, a rotator 314, and a stator 310 as 15 kg/hr.
[0119] In addition, for cold blast temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 40 degrees C and deltaT of T1 and T2 of T2] 50 degrees C whenever [-10 degrees-C and after room air temperature] at this time. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 19 degrees C. Moreover, for the weight mean diameter, 7.2 micrometers and 4 micrometer** was [10 micrometer** of the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time] 8.9% 50.2%.
[0120] Here, the mean particle diameter of a toner and 4micrometer**, and 10micrometer** are explained.
[0121] Although it is measurable in the mean diameter and particle size distribution of a toner with various approaches, such as a Coulter counter TA-II mold or a coal tar multi-sizer (coal tar company make), interface (product made from department machine of day) and PC9801 personal computer (NEC make) which outputs number distribution and volume distribution using a Coulter counter TA-II mold (coal tar company make) in this invention is connected, and electrolyte liquid prepares a NaCl water solution 1% using the 1st class sodium chloride. For example, ISOTON R-II (made in coal tar scientific Japan) can be used.
[0122] as a measuring method -- the inside of 100-150ml of said electrolyte water solutions -- as a dispersant -- a surface active agent -- 0.1-5ml of alkylbenzene sulfonate is added preferably, and 2-20mg of test portions is added further. It computed volume distribution and number distribution by the electrolyte liquid which . suspended the sample having performed distributed processing for about 1 - 3 minutes with the ultrasonic distribution vessel, and having measured the volume and the number 2 micrometers or more of a toner with said Coulter counter TA-II mold, using 100-micrometer aperture as an aperture. And it asked for the weighted mean particle size (D4: let the median of each channel be the central value of a channel) of the volume criteria searched for from the volume distribution concerning this invention, the accumulation number (10micrometer**) of the toner 10 micrometers or more for which it asked from volume distribution, and the accumulation number (4micrometer**) of the toner 4 micrometers or less for which it asked from number distribution.
[0123] Here, coarse powder is defined as 10 micrometers or more, and fines are defined as 4 micrometers or less. That is, it is shown that particle size distribution are Sharp, so that the value of 10 micrometer** and 4 micrometer** is small, and when large, it is shown that they are broadcloth particle size distribution.
[0124] Next, the toner whose weighted mean particle size is 7.2 micrometers was obtained by introducing the pulverizing article which was ground by the above-mentioned mechanical-cable-type grinder 301, and was obtained into the air-current type classifier 1 which has the configuration of drawing 4 , and classifying it.
[0125] 1.0 mass section addition of the dry type silica with a primary particle size of 12nm by which hydrophobing processing was carried out by hexamethyldisilazane and silicone oil was carried out to this toner 100 mass section, and it ******(ed) outside with the Henschel mixer and considered as the toner for assessment. [0126] The following items were evaluated using the Canon NP6350 copying-machine modification machine using this toner.
[0127] 330g of toners for <assessment -1> assessment is put in into a development counter, and it is left at a low-humidity/temperature room (15 degrees C, 10%) overnight (12 hours or more). ****** of 200 sheets is

performed using the chart for concentration assessment. Fogging in a solid white image is measured before and behind this. Assessment level is shown below.
[0128] The above-mentioned white image and the reflection factor of intact paper are measured with the reflective measurement machine REFLECTMETER for fogging measurement (Tokyo Denshoku Co., Ltd.), and let both difference be fogging. In this example, as shown in a table 1, the result with the very as good difference of fogging as 0.1% or less was obtained about assessment 1.
Intact paper reflection factor-solid white reflection factor = fogging %O : Less than [fogging 0.1%] O : 0.5 - 1.0% [of 0.1 - 0.5% / of fogging / O**:fogging] ** :fogging 1.0-1.5%**x: Fogging 1.5 - 2.0%x : More than fogging 2.0%[0129] About the wear situation of the grinding side of the rotator after operation termination, and a stator, it checked visually using the 10 times and 50 times as many magnifier as this, and judged on the following criteria. In this example, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.
O : -- **: which does not have wear in the grinding side of a rotator and a stator -- practical use is possible although wear is seen a little in the grinding side of a rotator and a stator -- wear is seen notably in the grinding side of x:rotator and a stator, and practical use is impossible -- [0130] The toner 2 was obtained like the example 1 except having made the amount of supply of the fine-particles raw material to a [example 2] mechanical-cable-type grinder into 20 kg/hr. In addition, when a mechanical-cable-type grinder ground a fine-particles raw material, for cold blast temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 52 degrees C and deltaT of T1 and T2 of T2] 62 degrees C whenever [-10 degrees-C and after room air temperature]. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 7 degrees C. Moreover, the weighted mean particle size of fine particles (classification article) while 45.3% and 10 micrometer** are [7.4 micrometers and 4 micrometer**] 9.8% for a weight mean diameter and the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time was classified at the classification process was 7.4 micrometers.
[0131] The obtained toner was ******(ed) outside like the example 1, and it considered as the toner 2 for assessment. Consequently, as shown in a table 1, the result very good about assessment 1 was obtained.
[0132] Moreover, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.
[0133] The toner 3 was obtained like the example 1 except having made the amount of supply of the fine-particles raw material to a [example 3] mechanical-cable-type grinder into 10 kg/hr. In addition, when a mechanical-cable-type grinder ground a fine-particles raw material, for cold blast temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 30 degrees C and deltaT of T1 and T2 of T2] 40 degrees C whenever [-10 degrees-C and after room air temperature]. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 27 degrees C. Moreover, the weighted mean particle size of fine particles (classification article) while 55.2% and 10 micrometer** are [7.0 micrometers and 4 micrometer**] 8.0% and the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time was classified at the classification process was 7.0 micrometers.
[0134] The obtained toner was ******(ed) outside like the example 1, and it considered as the toner 3 for assessment. Consequently, as shown in a table 1, the result very good about assessment 1 was obtained.
[0135] Moreover, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.
[0136] The toner 4 was obtained like the example 1 except having set 30 and the Rockwell C degree of hardness of a stator 310 to 55 for the Rockwell C degree of hardness of the rotator 314 of the [example 4] mechanical-cable-type grinder 301. In addition, when a mechanical-cable-type grinder ground a fine-particles raw material, for cold blast temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 41 degrees C and deltaT of T1 and T2 of T2] 51 degrees C whenever [-10 degrees-C and after room air temperature]. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 18 degrees C. Moreover, the weighted mean particle size of fine particles (classification article) while 51.0% and 10 micrometer** are [7.3 micrometers and 4 micrometer**] 9.5% for a weight mean diameter and the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time was classified at the classification process was 7.3 micrometers.
[0137] The obtained toner was ******(ed) outside like the example 1, and it considered as the toner 4 for

assessment. Consequently, as shown in a table 1, the result very good about assessment 1 was obtained.
[0138] Moreover, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.
[0139] The toner 5 was obtained like the example 4 except having made the amount of supply of the fine-particles raw material to a [example 5] mechanical-cable-type grinder into 20 kg/hr. In addition, when a mechanical-cable-type grinder ground a fine-particles raw material, for cold blast temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 53 degrees C and deltaT of T1 and T2 of T2] 63 degrees C whenever [-10 degrees-C and after room air temperature]. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 6 degrees C. Moreover, the weighted mean particle size of fine particles (classification article) while 46.0% and 10 micrometer** are [7.5 micrometers and 4 micrometer**] 10.3% for a weight mean diameter and the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time was classified at the classification process was 7.5 micrometers.
[0140] The obtained toner was ******(ed) outside like the example 1, and it considered as the toner 5 for assessment. Consequently, as shown in a table 1, the result very good about assessment 1 was obtained.
[0141] Moreover, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.
[0142] The toner 6 was obtained like the example 4 except having made the amount of supply of the fine-particles raw material to a [example 6] mechanical-cable-type grinder into 10 kg/hr. In addition, when a mechanical-cable-type grinder ground a fine-particles raw material, for cold blast temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 31 degrees C and deltaT of T1 and T2 of T2] 41 degrees C whenever [-10 degrees-C and after room air temperature]. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 28 degrees C. Moreover, the weighted mean particle size of fine particles (classification article) while 55.9% and 10 micrometer** are [6.9 micrometers and 4 micrometer**] 8.4% for a weight mean diameter and the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time was classified at the classification process was 6.9 micrometers.
[0143] The obtained toner was ******(ed) outside like the example 1, and it considered as the toner 6 for assessment. Consequently, as shown in a table 1, the result very good about assessment 1 was obtained.
[0144] Moreover, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.
[0145] The toner 7 was obtained like the example 1 except having set 25 and the Rockwell C degree of hardness of a stator 310 to 90 for the Rockwell C degree of hardness of the rotator 314 of the [example 7] mechanical-cable-type grinder 301. In addition, when a mechanical-cable-type grinder ground a fine-particles raw material, for cold blast temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 40 degrees C and deltaT of T1 and T2 of T2] 50 degrees C whenever [-10 degrees-C and after room air temperature]. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 19 degrees C. Moreover, the weighted mean particle size of fine particles (classification article) while 53.1% and 10 micrometer** are [7.3 micrometers and 4 micrometer**] 10.9% for a weight mean diameter and the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time was classified at the classification process was 7.3 micrometers.
[0146] The obtained toner was ******(ed) outside like the example 1, and it considered as the toner 7 for assessment. Consequently, as shown in a table 1, the result desirable about assessment 1 was obtained.
[0147] Moreover, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.
[0148]
[A table 1]

実施例の粉砕・分級運転条件

	実施例1	実施例2	実施例3	実施例4	実施例5	実施例6	実施例7
粉砕条件							
粉砕装置図	図1						
回転子/固定子 HRC 硬度	40/65	40/65	40/65	30/55	30/55	30/55	25/60
樹脂 Tg 温度(℃)	59						
冷風温度(℃)	−15	−15	−15	−15	−15	−15	−15
ジャケット冷却有無	有	有	有	有	有	有	有
T1 温度(℃)	−10	−10	−10	−10	−10	−10	−10
T2 温度(℃)	40	52	30	41	53	31	40
ΔT(℃)	50	62	40	51	63	41	40
Tg−T1(℃)	69	69	69	69	69	69	69
Tg−T2(℃)	19	7	27	18	6	28	19
回転子周速(m/s)	115	115	115	115	115	115	115
回転子/固定子間隙(mm)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
粉砕供給量(kg/hr)	15	20	10	15	20	10	15
D4	7.2	7.4	7.0	7.3	7.5	6.9	7.3
4μm↓	50.2	45.3	55.2	51.0	46.0	55.9	53.1
10μm↑	8.9	9.8	8.0	9.5	10.3	8.4	10.9
運転後の回転子及び固定子の摩耗状況	○	○	○	○	○	○	○
分級条件							
分級装置図	図4						
分級供給量(kg/hr)	18	24	12	18	24	12	18
評価1	◎	◎	◎	○	○	○	○△

[0149] The toner 1 for reference was obtained like the example 1 except having set 40 and the Rockwell C degree of hardness of a stator 310 to 40 for the Rockwell C degree of hardness of the rotator 314 of the [example 1 of reference] mechanical-cable-type grinder 301. In addition, when a mechanical-cable-type grinder ground a fine-particles raw material, for cold blast temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 42 degrees C and deltaT of T1 and T2 of T2] 52 degrees C whenever [-10 degrees-C and after room air temperature]. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 17 degrees C. Moreover, the weighted mean particle size of fine particles (classification article) while 54.0% and 10 micrometer** are [7.2 micrometers and 4 micrometer**] 11.6% for a weight mean diameter and the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time was classified at the classification process was 7.2 micrometers.

[0150] The obtained toner was ******(ed) outside like the example 1, and it considered as the toner 1 for reference. Consequently, although there was some fogging about assessment 1 as shown in a table 1, it was the result which is satisfactory practically.

[0151] Moreover, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.

[0152] The toner 2 for reference was obtained like the example 1 of reference except having made the amount of supply of the fine-particles raw material to the [example 2 of reference] mechanical-cable-type grinder into 20 kg/hr. In addition, when a mechanical-cable-type grinder ground a fine-particles raw material, for cold blast temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 52 degrees C and deltaT of T1 and T2 of T2] 62 degrees C whenever [-10 degrees-C and after room air temperature]. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 7 degrees C. Moreover, the weighted mean particle size of fine particles (classification article) while 49.1% and 10 micrometer** are [7.5 micrometers and 4 micrometer**] 13.0% for a weight mean diameter and the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time was classified at the classification process was 7.5 micrometers.

[0153] The obtained toner was ******(ed) outside like the example 1, and it considered as the toner 2 for reference. Consequently, although there was some fogging about assessment 1 as shown in a table 1, it was the result which is satisfactory practically.

[0154] Moreover, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.

[0155] The toner 3 for reference was obtained like the example 1 of reference except having made the amount of supply of the fine-particles raw material to the [example 3 of reference] mechanical-cable-type grinder into 10 kg/hr. In addition, when a mechanical-cable-type grinder ground a fine-particles raw material, for cold blast

temperature, T1 was [whenever / vortex-chamber internal temperature / in -15 degrees C and a mechanical-cable-type grinder / 31 degrees C and deltaT of T1 and T2 of T2] 41 degrees C whenever [-10 degrees-C and after room air temperature]. Moreover, Tg-T1 was 69 degrees C, and Tg-T2 was 28 degrees C. Moreover, the weighted mean particle size of fine particles (classification article) while 59.7% and 10 micrometer** are [a weight mean diameter] at 10.1% for 7.0 micrometers and 4 micrometer** and the pulverizing article which was ground by the mechanical-cable-type grinder 301 and obtained at this time was classified at the classification process was 7.0 micrometers.

[0156] The obtained toner was ******(ed) outside like the example 1, and it considered as the toner 3 for reference. Consequently, although there was some fogging about assessment 1 as shown in a table 1, it was the result which is satisfactory practically.

[0157] Moreover, when after [operation termination] inside-of-a-plane inspection was carried out, wear of a rotator and a stator was not generated.

[0158]

[A table 2]

参考例 1～3 の粉砕条件及び摩耗状況結果

	参考例 1	参考例 2	参考例 3
粉砕条件			
粉砕装置図	図 1		
回転子/固定子 HRC 硬度	40/40	40/40	40/40
樹脂 Tg 温度(℃)	59	59	59
冷風温度(℃)	−15	−15	−15
ジャケット冷却有無	有	有	有
T1 温度(℃)	−10	−10	−10
T2 温度(℃)	42	52	31
ΔT(℃)	52	62	41
Tg−T1(℃)	69	69	69
Tg−T2(℃)	17	7	28
回転子周速(m/s)	115	115	115
回転子/固定子間隙(mm)	1.5	1.5	1.5
粉砕供給量(kg/hr)	15	20	10
D4	7.2	7.5	7.0
4μm↓	54.0	49.1	59.7
10μm↑	11.6	13.0	10.1
運転後の回転子及び固定子の摩耗状況	○	○	○
分級条件			
分級装置図	図 4		
分級供給量(kg/hr)	18	24	12
評価 1	△	△	△

[0159]

[Effect of the Invention] By according to this invention, carrying out antifriction processing of the base material of the grinding side of a rotator and a stator, and grinding a toner using the mechanical-cable-type grinder with which the degree of hardness of the hardening layer of the rotator after antifriction processing differs from the degree of hardness of the hardening layer of a stator, as explained above The impact at the time of grinding can be controlled in the suitable condition, too much grinding can be prevented, and the manufacture approach of the mechanical-cable-type grinder which can be lessened [the particle size distribution of a toner] by Sharp and fines generating, and a toner is offered.

[0160] Furthermore, according to this invention, the manufacture approach of a toner that the toner with which there is no fogging in the non-image section especially to the bottom of a low-humidity/temperature environment, or generating of fogging was controlled by the above-mentioned surface preparation can be obtained is offered.

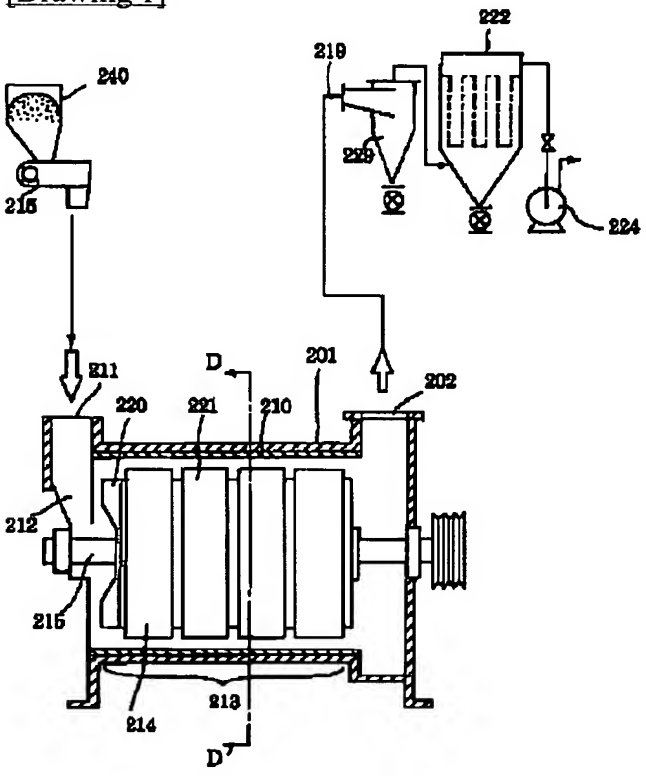
[Translation done.]

* NOTICES *

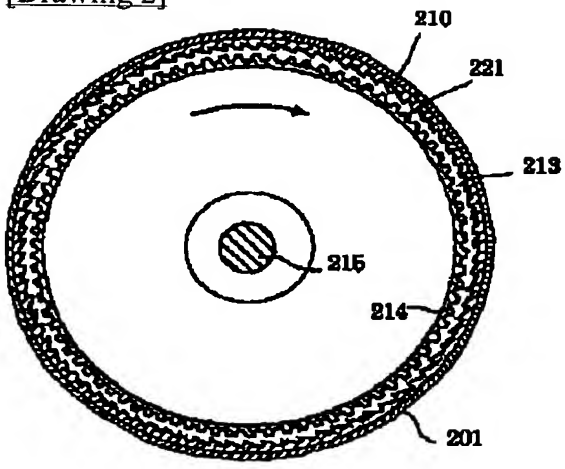
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

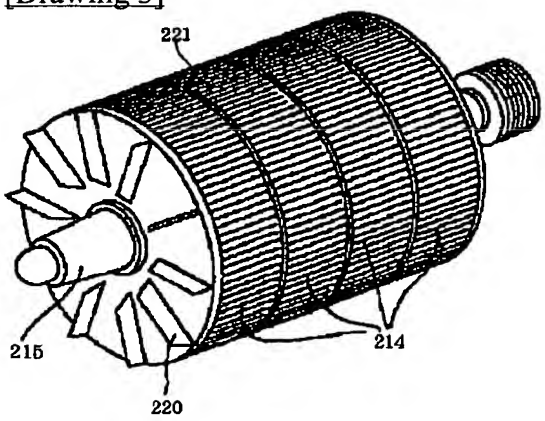
[Drawing 1]



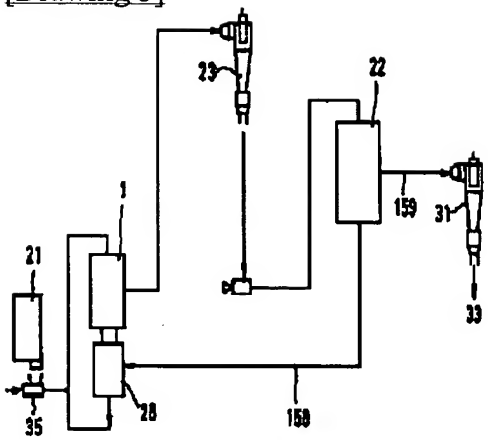
[Drawing 2]



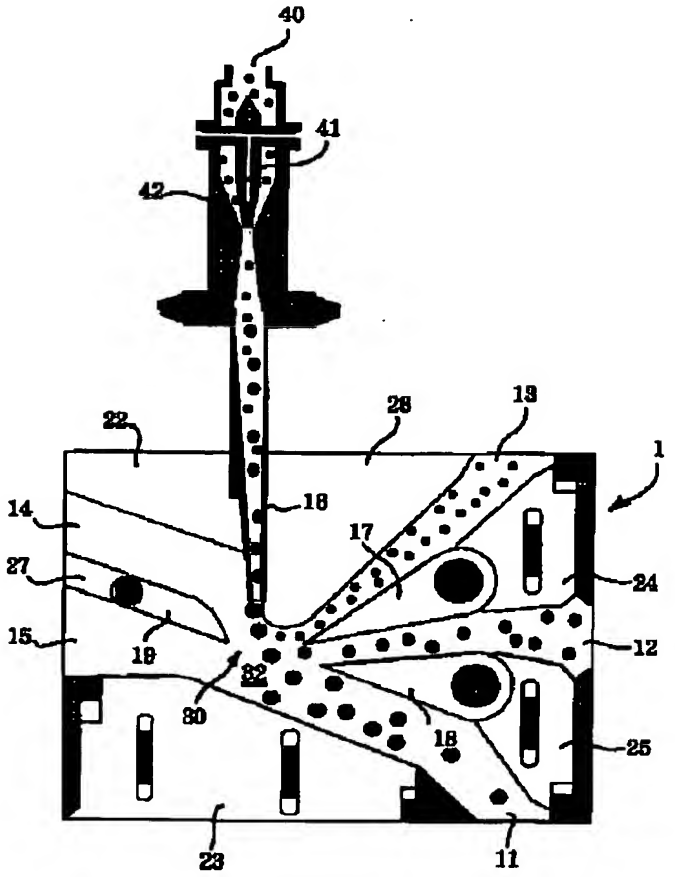
[Drawing 3]



[Drawing 5]



[Drawing 4]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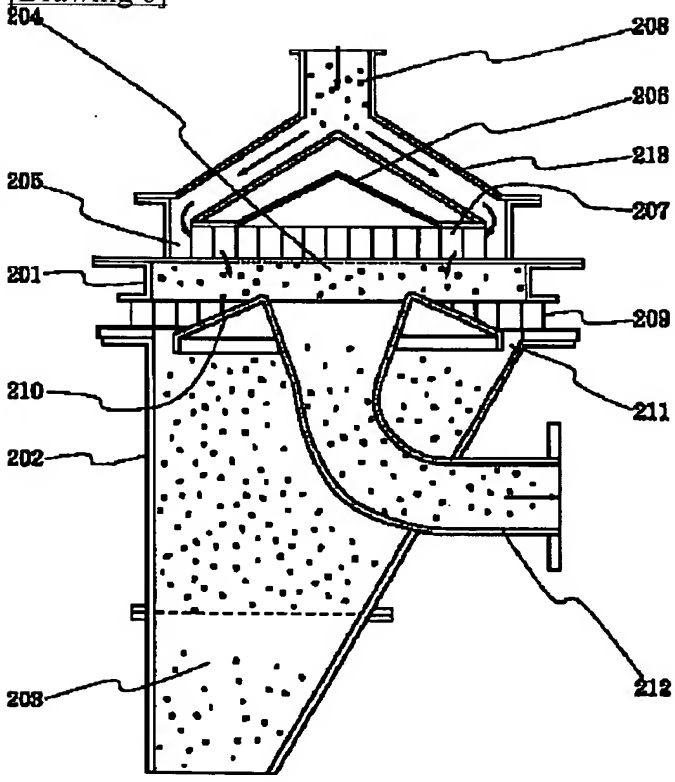
[Drawing 6]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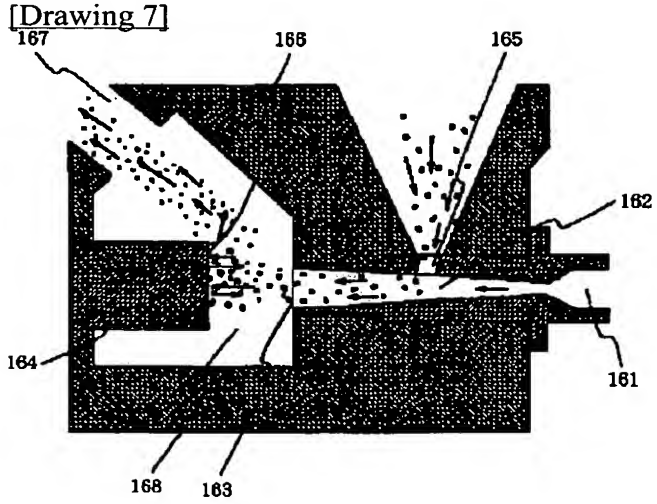
[Drawing 7]



[Translation done.]